MODULE 1 – INTRODUCTION

Objective

On completion of this module, participants will be able to:

- Identify the types of microorganisms found on food
- Define a bacterial spore

Microbiology is a broad term that covers the study of organisms that were not observed before the advent of the microscope. For our purposes in this course, this means bacteria, yeast, mold, viruses, and parasites. This module on general microbiology will address mainly bacteria but much of the information provided also applies to controlling yeast and molds. This course will focus on pathogens, those organisms that are capable of causing disease. Specific bacteria, virus, and parasites will be addressed.

Foodborne illness takes quite a toll. There may be as many as 33 million cases of foodborne illness in the United States annually, with an estimated 9,000 deaths. Knowledge of microbiology is essential to you as Public Health Environmentalists and your role in preventing foodborne disease. An understanding of microbial growth and the factors influencing growth will allow you to assess whether appropriate controls are present to prevent foodborne illness.

Not all microorganisms are alike. While some are pathogens, others cause spoilage, which results in objectionable textures and odors in a food. And some organisms are actually beneficial; they are used to make products like cheese, bread, pickles, yogurt, beer and wine.

Microorganisms are so small that most of them must be magnified about 1,000 times before they can be seen. Consider a drop of milk**.** In spoiled milk there are about 50 million organisms per milliliter, or a total population of about 50 billion organisms in a quart.

Fungi

Yeasts and molds are collectively called fungi. These organisms grow under conditions in which many bacteria cannot, such as low pH and low water activity.

Molds have many cells that make up a tangled mass of thread like structures called mycelium. Individual threads are called hypha. The most common molds grow by elongation of the hyphae and reproduce by fragmentation of the hyphae or production of spores.

Spores are a dormant form of a microorganism that are generally formed in response to adverse environmental conditions. Some bacteria produce spores too (see Bacteria, below), and some of these are of great significance in the food industry due to their highly resistant nature. While some molds are used in food processing, as in the manufacture of specialty cheeses such as Blue cheese, molds are also involved in food spoilage and some species produce mycotoxins, poisonous substances that can have serious health consequences.

Yeasts are single cells and typically larger than bacteria. Most reproduce by budding. Yeasts are used to ferment wine and beer and leaven bread. Fortunately, they are not associated with foodborne disease but do cause spoilage problems in foods such as sauerkraut, fruit juices, syrups, molasses, jellies, meats, beer and wine.

Bacteria are also single cells and generally come in two forms in foods spherical (cocci), or rod-shaped (bacilli). In addition, bacteria can be divided into two groups on the basis of their ability to form, or not to form spores. **Spores** are a dormant stage in the life cycle of the organisms. They are often compared to a plant seed that will germinate and grow when conditions are favorable. In general spores are extremely resistant to heat, cold, and chemical agents.